

CLAIMS :

1. An inspection device for detecting a foreign matter
in liquid filled in a transparent container
5 comprising:

a first irradiation light source which is
disposed backward of the transparent container and
irradiates a first irradiation light to the
transparent container;

10 a second irradiation source which is disposed at
a position other than the backward of the transparent
container and irradiates a second irradiation light of
a color other than that of the first irradiation light
to the transparent container;

15 a color separation use mirror which is disposed
on a transmission light optical passage of the first
irradiation light from the transparent container as
well as on a reflection light optical passage of the
second irradiation light from the transparent
20 container, causes to advance in straight the
transmission light of the first irradiation light and
performs color separation of the reflection light of
the second irradiation light and guides the same in
another optical passage than that of the transmission
25 light;

a first image taking means which is disposed on
the straight advancing optical passage and image-takes

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the transmission light of the first irradiation light;

a second image taking means which is disposed on the other optical passage and image-takes the reflection light of the second irradiation light; and

5 an image processing means which image processes picture images taken by the first and second image taking means and detects foreign matters in the liquid filled in the container.

10 2. An inspection device for detecting a foreign matter in liquid filled in a transparent container comprising:

a first irradiation light source which is disposed backward of the transparent container and
15 irradiates a first irradiation light to the transparent container light to the transparent container;

a second irradiation source which is disposed at a position other than the backward of the transparent
20 container and irradiates a second irradiation light of a color other than that of the first irradiation light to the transparent container;

a half mirror which is disposed on a transmission light optical passage of the first irradiation light
25 from the transparent container as well as on a reflection light optical passage of the second irradiation light from the transparent container and

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performs optical passage separation;

a first filter which is disposed on a straight
advancing optical passage of the half mirror and
selects the transmission light from the first
5 irradiation light;

a first image taking means which image-takes the
transmission light of the first irradiation light
selected by the first filter;

a second filter which is disposed on another
10 optical passage of the half mirror and selects the
reflection light of the second irradiation light;

a second image taking means which image-takes the
reflection light of the second irradiation light
selected by the second filter; and

15 an image processing means which image processes
picture images taken by the first and second image
taking means and detects foreign matters in the liquid
filled in the container.

20 3. An inspection devices for detecting a foreign
matter in liquid filled in a transparent container
according to claim 1 or 2, wherein the image
processing means detects foreign matters for every
first and second picture images taken by he first and
25 second image taking means as well as compares the
foreign matters detected from the first and second
picture images to judge characteristics of the foreign

matters.

4. A foreign matter inspection system in which transparent containers being filled with liquid are successively conveyed and the foreign matter inspection device according to claim 1 or 2 is disposed along the conveying route.

5. An inspection device for inspecting foreign matters in liquid filled in a transparent container which comprising;

a first irradiation light source which is disposed backward the transparent container and irradiates a first irradiation light to the transparent container;

a second irradiation light source which is disposed adjacent the first irradiation light source and irradiates a second irradiation light to the transparent container from a direction different from that of the first irradiation light;

an image taking means which image takes transmission light on a transmission light optical passage of the first irradiation light from the transparent container as well as image takes irregular reflection light of the second irradiation light; and

a detection means which detects foreign matters in the liquid filled in the transparent container

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based on the picture images taken by the image taking means.

6. An inspection device for inspecting foreign matters
5 in liquid filled in a transparent container according to claim 5, wherein the first and second irradiation lights are irradiated at different timings.

7. A foreign matter inspection device for inspecting
10 foreign matters in liquid filled in a transparent container comprising:

a first irradiation light source which is disposed backward the transparent container and irradiates first irradiation light to the transparent
15 container;

a second irradiation light source which is disposed adjacent to the first irradiation light source and irradiates second irradiation light of different color from that of the first irradiation
20 light from different direction from that of the first irradiation light to the transparent container;

a color separation use mirror which disposed on a transmission light optical passage of the first irradiation light from the transparent container as
25 well as on a reflection light optical passage of the second irradiation light from the transparent container, causes to advance in straight the

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transmission light of the first irradiation light and performs color separation of the reflection light of the second irradiation light and guides the same in another optical passage than that of the transmission
5 light;

a first image taking means which is disposed on the straight advancing optical passage and image-takes the transmission light of the first irradiation light;

10 a second image taking means which is disposed on the other optical passage and image-takes the reflection light of the second irradiation light; and

an image processing means which image processes picture images taken by the first and second image taking means and detects foreign matters in the liquid
15 filled in the container.

8. A foreign matter inspection device for inspecting foreign matters in liquid filled in a transparent container comprising:

20 a first irradiation light source which is disposed backward the transparent container and irradiates first irradiation light to the transparent container;

a second irradiation light source which is
25 disposed adjacent to the first irradiation light source and irradiates second irradiation light of different color from that of the first irradiation

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light from different direction from that of the first irradiation light to the transparent container;

a half mirror which is disposed on a transmission light optical passage of the first irradiation light
5 from the transparent container as well as on a reflection light optical passage of the second irradiation light from the transparent container and performs optical passage separation;

a first filter which is disposed on a straight
10 advancing optical passage of the half mirror and selects the transmission light from the first irradiation light;

a first image taking means which image-takes the transmission light of the first irradiation light
15 selected by the first filter;

a second filter which is disposed on another optical passage of the half mirror and selects the reflection light of the second irradiation light;

a second image taking means which image-takes the
20 reflection light of the second irradiation light selected by the second filter; and

an image processing means which image processes picture images taken by the first and second image taking means and detects foreign matters in the liquid
25 filled in the container.

9. A foreign matter inspection device for inspecting

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foreign matters in liquid filled in a transparent container according to one of claims 5 through 8, wherein the first and second irradiation lights from the first and second irradiation light sources are
5 guided through a light guide device.

10. A foreign matter inspection device for inspecting a foreign matter contaminated in liquid filled in a transparent container comprising:

10 a first illumination light source which irradiates a first light to the transparent container and is disposed on one side of the transparent container and at a position substantially on a focal point of the transparent container effecting as a lens
15 and the first illumination light source is configured in a linear shape which covers substantial longitudinal length of the transparent container;

a second illumination light source which irradiates a second light to the transparent container
20 and is disposed adjacent to the first illumination light source and at a position substantially on a focal point of the transparent container effecting as a lens and the second illumination light source is configured in a linear shape which covers substantial
25 longitudinal length of the transparent container;

an inspection use sensor means which is disposed on the other side of the transparent container at a

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position which permits observation of both transmission light of the first light transmitted through the transparent container and reflection light of the second light which is caused by a possible
5 reflective foreign matter contaminated in the liquid from a same direction on an optical passage connecting between the first illumination light source and the inspection use sensor with respect to the transparent container; and

10 an image processing unit which receives a picture image form by the transmission light and a picture image formed by the reflection light from the inspection use sensor means and determines a foreign matter contained in the liquid based on the received
15 picture images.

11. A foreign matter inspection device for inspecting a foreign matter contaminated in liquid filled in a transparent container according to claim 10, wherein
20 the optical properties of the first and second lights are differentiated so as to permit discrimination between the transmission light and the reflection light in the image processing unit.

25 12. A foreign matter inspection device for inspecting a foreign matter contaminated in liquid filled in a transparent container according to claim 10, further

comprises either a color separation mirror or a half mirror on the optical passage, wherein the inspection use sensor means includes first and second CCD cameras, the first CCD camera is disposed on the 5 optical passage so as to receive the transmission light passed through either the color separation mirror or the half mirror and the second CCD is disposed on an optical passage other than the optical passage so as to receive the reflection light 10 reflected by either the color separation mirror or the half mirror.

13. A foreign matter inspection device for inspecting a foreign matter contaminated in liquid filled in a 15 transparent container according to claim 10, wherein the second illumination light source includes a pair of linear shaped illumination sources between which the linear shaped first illumination light source is sandwiched.